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**Summary of the 2013 Snow Crab Trawl Survey
in the Southern Gulf of St. Lawrence**

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Foreword

This series documents the scientific basis for the evaluation of aquatic resources and ecosystems in Canada. As such, it addresses the issues of the day in the time frames required and the documents it contains are not intended as definitive statements on the subjects addressed but rather as progress reports on ongoing investigations.

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ABSTRACT

This document summarizes the details of the 2013 snow crab bottom trawl survey of the southern Gulf of St. Lawrence. The primary objective of the survey is to provide the data on abundance and distribution of snow crab and other by-catch species. The survey was conducted from July 9 to October 14, 2013 using a new chartered commercial fishing vessel, the "*Jean Mathieu*". A total of 355 stations were trawled and 352 stations were successfully completed. This year two major changes in protocol were made. First, the net monitoring system has been totally changed from 'Netmind[®]' to compatible 'e-Sonor[®]' system. Second, the total number of stations was increased from 325 in 2012 to 355. Details on the survey protocols, timing of the survey, the characteristics of the individual trawl tow, and summary of snow crab catches and catches of others species are provided.

Sommaire du relevé au chalut du crabe des neiges dans le sud du golfe du Saint-Laurent pour 2013

RESUME

Ce document fournit un résumé des détails sur le relevé au chalut de fond du crabe des neiges entrepris dans le sud du golfe du Saint-Laurent en 2013. L'objectif principal de ce relevé est de fournir les données d'abondance et la distribution du crabe des neiges et d'autres espèces de captures accessoires. Le relevé a été entrepris du 9 juillet au 14 octobre 2013 à bord d'un nouveau navire de pêche commerciale nolisé *Jean-Mathieu*. Au total, 355 stations ont été visitées parmi lesquelles 352 stations ont été chalutées avec succès. Cette année, il y a eu deux changements dans le protocole par rapport à 2012. En premier, le système de sondes de chalut a été totalement changé de Netmind® à e-Sonor® qui est compatible avec le premier. Deuxièmement, le nombre total de stations a été augmenté de 325 à 355. Les détails sur le protocole, le déroulement du relevé, les caractéristiques de chaque trait ainsi que les sommaires des captures du crabe des neiges et des espèces accessoires sont présentés.

INTRODUCTION

This document summarizes the details of the 2013 snow crab/multispecies bottom trawl survey of the southern Gulf of St. Lawrence. The primary objective of the survey is to provide the fishery-independent data to assess the status of the snow crab (*Chionoecetes opilio*) resource of the southern Gulf of St. Lawrence. The specific objectives of the survey were to estimate abundances for different biological categories of snow crab, their spatial distribution, and monitor their biological characteristics, and to collect abundance and spatial distribution information of other invertebrates and fish species captured during the survey.

In the present document, only the summary of the survey activities including detailed information on the protocol deployed and characteristics of each tow as well as the catches of snow crab and by-catch species are provided.

SURVEY DESIGN AND PROTOCOL FOR 2013

The survey protocol (target number of stations, their positions and sampling grid setting) was modified for 2013 from previous years (DFO 2013; Hébert et al. 2013). The survey spatial sampling design was based on a survey area partitioned into 355 square grids of 12.7 km by 12.7 km (Fig. 1). In each grid identified for sampling, a primary station and two alternative stations in case the primary station could not be trawled were randomly chosen prior to the survey. If the trawl net was damaged while fishing at the primary station and the station was considered untrawable by the onboard biologist, a tow at the first alternate sampling station within the same grid was done. If the trawl net was damaged at the first alternate station, a tow was conducted at the second alternate station. If the primary and the two alternate stations within the grid were considered untrawable, the grid was not sampled further.

Only good tows are considered in the snow crab assessment (see Hébert et al. 2014). Bad tows are defined as torn or damaged nets resulting in loss of specimens and/or uncompleted tows due to the weather or sea conditions. In cases when the net has physically performed well but a malfunction of the electronic net sensors occurred (no trawl mensuration data available), the tow was considered good and the swept area for that tow was estimated as the mean swept area of the nearest 10 successful neighboring tows.

Standard tows were made using a Nephrops trawl at a speed of 2 knots with a target duration of five minutes, based on the time the trawl touches the sea floor as determined by the analysis of hydro acoustic system (Moriyasu et al. 2008). Information about the geometry of the trawl (horizontal spread of the doors and wings, vertical opening of the trawl and depth) was recorded for each tow using hydro acoustic sensors (e-Sonar®). Descriptions of the methodology for estimating the swept surface are provided by Moriyasu et al. (2008).

Trawling was always done during civil twilight time (civil twilight begins prior to sunrise when the geometric center of the sun reaches 6° below the horizon and ends when the geometric center of the sun reaches 6° below the horizon after the sunset). There is enough light from the sun during this period that artificial sources of light may not be needed to carry on outdoor activities; this usually occurs 30 minutes before sunrise and after sunset.

The sampling protocol calls for the survey to be postponed in the event of adverse weather conditions, i.e. winds above 20 to 25 knots or sea conditions that may hinder the proper maneuverability of the boat.

For most of the sampling stations visited, a vertical profile of the water column was made using a CTD (SeaBird 19 plus®) equipped with a dissolved oxygen sensor (SBE 43) and a WetStar®

fluorometer. The sensors sampled the following variables: temperature, conductivity (salinity), pH, and fluorescence.

For each successful trawl tow, the catch was sorted by species and the number of individuals, fish and invertebrates, was recorded. Species identifications were made based on taxonomic information in Scott and Scott (1988), Brunel et al. (1998), Pohle (1990), and Squires (1990). For snow crab, detailed measurements included the carapace width, chela height, shell hardness, gonad color, egg color, missing legs, and disease identification.

In addition, whole specimens from different fish and invertebrate taxa were collected, either for taxonomic identification purposes or for more in-depth laboratory analysis. Although species identification other than snow crab were recorded since the first year of the survey, the protocol and effort put on species other than snow crab have not been consistent over the years. It is only since 2006 that more complete collection of information on the count per species began and since 2010 that size measurements of sub-samples (maximum of 100 individuals per station) of fish species at 100 pre-selected stations was conducted (Annex 1). All other catches were sorted by species or species group, counted, and discarded.

SURVEY ACTIVITIES IN 2013

For the 2013 survey, a new vessel, the "*Jean-Mathieu*" was used. The "*Jean-Mathieu*" is a steel hull vessel measuring 64' 11" in length, gross weight of 99 t, and powered by a 720 horse power engine. The previous vessel used for the survey between 2003 and 2012 season was the "*Marco-Michel*", a fiberglass hulled vessel measuring 64' 11" in length, with a gross weight of 145 t, and powered by a 660 horse power engine. No fishing power comparison was undertaken between these two vessels. In addition, a new acoustic net sensor system "e-Sonar®" was introduced for a real-time net behavior monitoring during the survey.

PERSONNEL AND ONBOARD TASKS

There were always at least five crew members during the survey (Table 1). Ghislain Bourgeois who acted as a substitute captain on the previous survey vessel "*Marco-Michel*" took command on the new vessel "*Jean-Mathieu*". O'Neil Poirier, Denis Poirier, and Daniel Langford oversaw general trawling operations (winch operation). The net repair was done by Marc-André O'Connor (trips 1-3) and Daniel Langford (trip 4-8), supervised by Ghislain Bourgeois.

Three employees (Marcel Hébert, Jean-François Landry, and Pierre DeGrâce) from DFO Science participated in the 2013 survey such that there were always two DFO Science employees on board at any given time throughout the survey period. One DFO Science member was responsible for the operation of the e-Sonar®, CTD data recording, measurement of by-catch and determining the tow quality. CTD operation was ensured by Denis Ménard and Denis Poirier. The second DFO Science member was responsible for the measurement data on crab, assisted by Jules Bourgeois. The technical assistant Stephane Albert, a crew member, who has been working on the snow crab survey since 1993 was replaced by Jules Bourgeois, who was an at sea observer trained by Biorex.

DURATION AND TIMING OF THE SURVEY

The 2013 survey started on July 9 and ended on October 14, 2013, a period of 98 days. A technical problem with onboard computer system delayed the start of the survey from the planned date of July 7.

A total of 355 grids were sampled and 352 grids were successfully completed; three grids were deemed to be untrawable. It took 444 tows to complete the survey. Among the 352 successful

girds, 239 tows were done at primary station with acceptable net sensor data, 44 tows were successful at primary station without acceptable net sensor data (for which the swept area estimation from surrounding 10 stations were used), 48 tows were done at the first alternate station with acceptable net sensor data, 11 tows were also done at the first alternate station without acceptable net sensor data, 9 tows were done at the second alternate station with acceptable net sensor data and one grid was sampled using the third alternate station without acceptable net sensor data (Table 2).

It took eight (8) trips to complete the survey with a trip duration varying from 5 to 7 days and the number of stations visited varying from 34 (leg VIII) to 53 (legs III and VII) (Table 3). Fifty percent (49 days) of the total duration of the survey were spent at sea. A total of 43 days (complete or partial days) were spent at the wharf for trawl repair or bad weather. Serious net damage (when the crew cannot repair onboard) occurred 28 times throughout the survey. A total of seven Nephrops trawl nets were used during the survey and two nets required extensive repairs (not repairable during the season). The survey was completed 21 days later than in 2012 (23 September). Historical information of the survey timing and duration are summarized in Figure 2.

Trawl activity was planned to take place during civil twilight time. However, 8 tows (the last tow of the day) were started (2 to 23 minutes) after the evening civil twilight time (Table 3).

Survey Itinerary

There were eight trips for the 2013 survey, departing from different locations (Table 3 and Figures 3, 4).

1. The first trip departed from the port of Caraquet and trawled in the Area 12E, the northern part of Area 12F, and returned to Caraquet (itinerary marked in dark black on Fig. 3).
2. The second trip departed from Caraquet and conducted sampling in Shediac Valley and off western PEI (in red) and berthed at the wharf in Cap-aux-Meules, Que.
3. The third trip departed from Cap-aux-Meules, sampling northern Bradelle Bank and the northern most part of the survey area, and returned to Caraquet (in yellow).
4. The fourth trip started from Caraquet and sampled mainly the Baie des Chaleurs and finishes the Shediac Valley area then returned to Cap-aux-Meules (in vivid green).
5. The fifth trip departed from Cap-aux-Meules and trawled in Area 12F as well as Bradelle Bank areas then returned to Souris PEI (in aqua).
6. The sixth trip departed from Souris and trawled off eastern PEI and Bradelle Bank areas and returned to Cap-aux-Meules (in blue).
7. The seventh trip departed from Cap-aux-Meules and trawled Area 19 as well as the old Area 18 and returned to Cap-aux-Meules (in clear pink).
8. The last trip departed Cap-aux-Meules and trawled off south shore of the Magdalen Island plus finishes the Bradelle Bank and returned to Cap-aux-Meules (in bronze).

Monthly completion of trawl stations (Figure 4) shows that the stations along the Laurentian Channel and off central and western Prince Edward Island were sampled in July while the stations in Chaleur Bay, Gaspesie, Bradelle Bank, and the Magdalen Trough as well as southeastern corner of Area 12F were sampled in August. In September and October, stations in the Magdalen Trough towards western Cape Breton Island were sampled (Fig. 4).

QUALITY OF TOW

A total of 444 tows were conducted in 2013. Of these, 282 tows were completed at the primary stations, 58 tows were completed at the first alternate station, 11 tows at the second alternate station and one tow at the third alternate station (September 16). Total bad tows were 92 representing 21% of the total number of tows conducted in 2013. This was the highest percentage of bad tows in the time series beginning in 1988 (historic average at 11%). There was no apparent clustering in geographic distribution of bad tows (Fig. 5).

Three survey grids were deemed to be untrawlable after three attempts (one primary and two alternate stations). These grids are located in the northern part of Bradelle Bank closer to Area 12F, North of Cavendish, Prince Edward Island and north of East Point, Magdalen Islands (station numbers 204, 117 and 312, respectively in Figure 5).

Although the total number of grids to be trawled in 2013 was 355, there were 8 tows which after completion fell into the neighboring grid, which resulted in 8 vacant grids and 8 grids with double stations (Fig. 6).

The details of each tow are summarized in Annex 1. Information in Annex 1 includes for each tow the date, tow number, geographic position, swept area estimate, depth, temperature, as well as catch in number per tow and estimated weight per tow of commercial crabs with carapace condition 1-2 and 3-5, and the quality indicator of each tow. The depth at trawl station varied from 32.92 m to 365.76 m and the temperature varied from -0.3 to 7.6°C. The catches in number of commercial crab with carapace conditions 1-2 and 3-5 ranged from 0 to 102 and from 0 to 41, respectively. The highest number of commercial crab caught was observed at the station at lat. 47.5112°N, long. 60.4867°W (Area 12F) on September 30.

CATCH OF SNOW CRAB AND OTHER SPECIES

The historical trend in mean number per tow of male snow crab sampled (sizes, carapace conditions and maturity status combined) during the surveys are shown in Figure 7. The mean numbers per tow of male snow crab have fluctuated through the time series with notable peak values in 1990 and 1999 and the lowest in 2009 (the 1996 value should be disregarded as the survey was conducted only in Area 19) (Fig. 7). The total number of commercial male snow crab captured decreased from 2,093 in 2012 to 1,886 in 2013 (Table 5).

Commercial-sized adult male snow crab observed during the survey peaked in 1993 with over 16 crabs per tow (Fig. 8) and peaked again in 2004 at approximately 10 crabs per tow. In 2013, there was a mean of 5.4 crabs per tow during the survey with a mean unadjusted density of 1,994 crabs per km² (Table 5). The mean number per tow of crab with carapace condition 5 has been low compared to the period between 1994 and 1999 (Fig. 8).

The mean number of female crabs per tow has also fluctuated through the time series (Fig. 9) but showed a decreasing trend since 1988. Notable peaks were observed during the 1991 and 1999 surveys and the lowest value was in 2006 (the 1996 value should be disregarded as the survey was conducted only in Area 19).

The mean individual weight of commercial-sized adult male crab was 596 grams, higher than the previous years (2011 and 2012) and historical average (585 g) (Table 5). The density values (crab / tow and number / km²) were at 5.4 and 1,994, respectively, lower than the previous years (2011 and 2012) and below the historical average (5.7 / tow and 2,227 / km²). Further details of snow crab catch (e.g. size frequency of immature/adolescent and adult males and immature and adult females) are provided in Hébert et al. (2014).

The information of by-catch species during the 2013 survey is summarized in Table 6. For invertebrates, some species are gathered into common name group (e.g. anemone, brittle star, sea cucumber, shrimp, starfish and whelk). A total of 30 species of invertebrates (groups) and 52 species of fish were sampled during the 2013 survey (Table 6). The most common invertebrate species captured (and counted), in number, was snow crab (21,621) followed by shrimp group (18,436) and sea urchin group (16,669) (note: brittle stars were not counted). The most common species of fish captured was American plaice (28,209) followed by cod (3,179) (Table 6).

In terms of frequency of observation (number of grid with presence) for invertebrates, snow crab was most widely distributed (320 / 352 grids) followed by starfish group (281 / 352 grids) and sea urchin group (213 / 352 grids). For fish, American plaice was the most widely distributed sampled fish (325 / 352 grids) followed by cod (243 / 352 grids) and Atlantic staghorn sculpin (114 / 352 grids) (Table 6).

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TABLES

Table 1. List of DFO scientific members and 'Jean-Mathieu' crew with their main task during the 2013 survey. Task acronyms are as follows: Crab Meas: Crab measurements; CTD: CTD operation; MSP: multispecies measurements, Mend/oper: Net mending and trawl operation.

Trip	DFO M. Hébert	DFO J.F. Landry	DFO P. DeGrâce	Captain G. Bourgeois	CTD/MSP O. Poirier	CTD/MSP D. Ménard	CTD/MSP D. Poirier	Crab Meas J. Bourgeois	Mend./oper/MSP M.-A. O'Connor
I	X	X	na	X	D. Eloquin	X	X	X	X
II	X	X	na	X	O. Poirier	X	X	X	X
III	na	X	X	X	X	X	X	X	D.Langford
IV	na	X	X	X	X	X	X	X	X
V	X	X	na	X	X	X	X	X	X
VI	na	X	X	X	X	X	X	X	X
VII	X	X	na	X	X	X	X	X	X
VIII	X	na	X	X	X	X	X	X	X

Table 2. Number of grids sampled in total and by quality of tow (QT), total number of tows conducted and the percentage of bad tows, for surveys from 1997 to 2012. Quality of tow labels are as follows: QT1 = successful trawl catch with acceptable area swept data; QT2 = successful trawl catch with unusable area swept data; QT3 = successful tow at the first alternate station with acceptable area swept data; QT4 = successful tow at the first alternate station with unusable area swept data, QT5 = successful tow at the second alternate station with acceptable area swept data, QT6 = successful tow at the second alternate station with unusable area swept data, QT7 = successful tow at the third alternate station with acceptable area swept data, QT8 = unsuccessful tows and grid deemed to be untrawlable.

Year of survey	Total	QT 1	QT 2	QT 3	QT 4	QT 5	QT 6	QT 7	QT 8	Total number of tow	% bad tow
1997	259	190	51	15	3	0	0	0	0	277	6.5
1998	261	152	95	9	3	1	1	0	0	277	5.8
1999	277	127	127	14	6	1	2	0	0	303	8.6
2000	280	232	30	10	1	6	0	0	0	302	7.3
2001	292	253	15	13	7	1	2	1	0	321	9.0
2002	319	285	13	15	4	1	1	0	0	342	6.7
2003	317	283	10	13	1	6	1	3	0	354	10.5
2004	333	271	46	4	5	6	0	1	0	357	6.7
2005	344	290	11	32	3	8	0	0	0	395	12.9
2006	354	294	34	17	1	8	0	0	1	395	10.4
2007	355	294	31	13	3	12	1	1	0	400	11.3
2008	355	284	37	23	0	8	1	2	0	402	11.7
2009	355	293	39	10	0	11	1	0	0	388	8.5
2010	354	285	32	23	7	7	0	0	1	401	11.7
2011	353	274	46	24	3	3	2	1	2	401	12.0
2012	321	220	50	36	5	7	1	2	4	400	19.8
2013	352	230	52	45	13	10	1	1	3	444	20.7

Table 3. Survey performance statistics by trip number and in total for the 2013 trawl survey.

Performance statistics	Trip I	Trip II	Trip III	Trip IV	Trip V	Trip VI	Trip VII	Trip VIII	Total
Duration (days)	10	5	8	7	11	8	9	7	
Number of days at sea (days)	7	5	7	5	7	6	6	6	49
Number of stations visited	50	34	53	35	51	45	53	34	355
Tows completed at primary station	38	20	48	27	38	37	49	25	282
Tows completed at first alternate station	9	12	3	7	10	6	3	8	58
Tows completed at second alternate station	1	2	2	1	2	1	1	1	11
Tows completed at third alternate station	0	0	0	0	0	1	0	0	1
Number of abandoned grids	2	0	0	0	1	0	0	0	3
Stations with serious net damage (number)	3	3	2	5	5	4	2	4	28

Table 4. Start and end time of daily fishing operations and corresponding morning (mCtw) (sunrise) and evening (eCtw; sunset) civil twilight times during the 2013 trawl survey. Civil twilight and sun rise and sunset times were for Gaspé, Quebec (48°50'00" N, 64°28'54" W).

Trip number	Date	mCtw/ Sunrise*	Time of first tow	Time of last tow	eCtw/ Sunset
I	9-Jul-13	3h43/4h19	5h07	20h17	20h22/21h03
I	10-Jul-13	3h45/4h26	5h17	21h07*	20h21/21h03
I	11-Jul-13	3h45/4h26	5h19	7h02	20h21/21h01
I	12-Jul-13	3h46/4h27	4h58	20h31	20h20/21h01
I	13-Jul-13	3h47/4h28	5h05	19h51	20h19/21h00
I	14-Jul-13	3h48/4h29	5h10	20h59	20h18/20h59
I	15-Jul-13	3h50/4h30	5h28	19h14	20h18/20h58
II	22-Jul-13	3h59/4h38	5h21	20h37	20h11/20h50
II	23-Jul-13	4h00/4h39	5h30	18h14	20h09/20h49
II	24-Jul-13	4h02/4h41	5h32	19h32	20h08/20h47
II	25-Jul-13	4h03/4h42	5h29	20h41	20h07/20h46
II	26-Jul-13	4h05/4h43	5h40	10h42	20h06/20h44
III	2-Aug-13	4h15/4h52	18h07	19h14	19h56/20h33
III	3-Aug-13	4h17/4h52	5h32	20h00	19h55/20h32
III	4-Aug-13	4h18/4h55	5h26	19h28	19h53/20h30
III	5-Aug-13	4h20/04h56	5h43	19h57	19h52/20h28
III	6-Aug-13	4h21/4h58	7h58	19h12	19h50/20h27
III	7-Aug-13	4h23/4h59	5h35	20h27*	19h48/20h25
III	8-Aug-13	4h24/5h00	5h39	19h00	19h47/20h23
IV	13-Aug-13	4h32/5h07	5h48	19h36	19h38/20h14
IV	14-Aug-13	4h34/5h09	6h06	10h13	19h36/20h12
IV	16-Aug-13	4h37/5h12	5h52	17h21	19h33/20h08
IV	17-Aug-13	4h38/5h13	6h03	19h37	19h31/20h06
IV	18-Aug-13	4h40/5h24	5h49	18h05	19h29/20h04
V	27-Aug-13	4h54/5h27	6h13	19h38	19h12/19h45

Trip number	Date	mCtwt/ Sunrise*	Time of first tow	Time of last tow	eCtwt/ Sunset
V	28-Aug-13	4h55/5h29	6h08	16h29	19h10/19h43
V	31-Aug-13	5h00/5h33	13h20	18h03	19h04/19h37
V	1-Sep-13	5h01/5h34	6h46	18h48	19h02/19h35
V	4-Sep-13	5h06/5h39	17h28	19h09	18h56/19h28
V	5-Sep-13	5h08/05h40	6h19	19h17	18h53/19h26
V	6-Sep-13	5h09/5h41	6h37	19h06	18h51/19h24
VI	10-Sep-13	5h15/5h47	15h37	19h22*	18h43/19h15
VI	11-Sep-13	5h16/5h48	6h41	19h16*	18h41/19h13
VI	12-Sep-13	5h18/5h50	6h35	18h33	18h39/19h11
VI	14-Sep-13	5h21/5h53	13h00	17h47	17h53/18h34
VI	15-Sep-13	5h22/5h54	6h31	19h03	18h32/19h04
VI	16-Sep-13	5h24/5h56	6h40	18h42	18h30/19h02
VII	25-Sep-13	5h37/6h08	6h50	18h36	18h11/18h42
VII	28-Sep-13	5h41/6h13	6h45	18h48*	18h05/18h36
VII	29-Sep-13	5h43/6h14	6h45	18h27	18h02/18h34
VII	30-Sep-13	5h44/6h16	6h45	18h53*	18h00/18h32
VII	1-Oct-13	5h46/6h17	6h55	18h15	17h58/18h30
VII	2-Oct-13	5h47/6h19	6h55	17h11	17h56/18h28
VIII	9-Oct-13	5h57/6h29	10h05	17h30	17h42/18h13
VIII	10-Sep-13	5h59/6h30	16h17	18h07	17h40/18h11
VIII	11-Oct-13	6h00/6h32	7h07	18h01	17h38/18h09
VIII	12-Oct-13	6h02/6h33	7h31	18h30*	17h36/18h07
VIII	13-Oct-13	6h03/6h35	7h06	18h23*	17h34/18h05
VIII	14-Oct-13	6h05/6h36	7h32	7h32	17h32/18h03

* The last tow of the day started after evening twilight time.

Table 5. Number of commercial-sized (≥ 95 mm carapace width) adult male crabs captured during the survey, mean number of crabs per tow (unadjusted), estimated mean weight of commercial-sized adult crabs, and mean density (number per km²) of commercial crab, number of grids sampled and mean swept area of successful tows, 1997 to 2013.

Year	Number of crabs sampled	Crabs per tow	Mean weight (g)	Crab density (number per km ²)	Number of grids sampled	Mean swept area (m ²)
1997	1,335	5.2	600	2,383	213	2,245
1998	1,419	5.4	596	2,258	215	2,352
1999	1,472	5.3	563	2,166	225	2,542
2000	1,346	4.8	587	1,798	224	2,717
2001	1,724	5.9	540	2,168	225	2,658
2002	1,913	6.0	546	2,530	229	2,504
2003	2,682	8.5	560	3,150	226	2,921
2004	3,321	9.6	577	3,221	229	3,200
2005	2,327	6.8	585	2,656	233	2,778
2006	2,302	6.5	616	2,558	259	2,850
2007	1,911	5.4	610	2,252	259	2,768
2008	1,431	4.0	611	1,787	259	2,658
2009	900	2.5	610	1,029	259	2,847
2010	1,057	3.0	607	1,280	258	2,734
2011	1,970	5.6	584	2,036	257	2,708
2012	2,093	6.5	566	2,359	321	2,677
2013	1,886	5.4	596	1,994	352	2,600

Table 6. Summary of total catches (by number and weight) by species of invertebrates and fish, and number of grids out of 352 sampled where the species were present in the catches of the survey in 2013.

Scientific name	Common name	Catch in number	Number of grids	Total weight (g)
<i>Alosa pseudoharengus</i>	Alewife	2	1	260
<i>Aspidophoroides monopterygius</i>	Alligator-fish	130	45	1,556
<i>Hippoglossoides platessoides</i>	American plaice	28,209	325	2,134,683
Actiniaria *	Anemones *	11,161	66	195,242
<i>Artediellus uncinatus</i>	Artic hook ear sculpin	8	3	610
<i>Gymnocanthus tricuspis</i>	Artic staghorn sculpin	1,026	114	71,668
<i>Lycodes terraenovae</i>	Atlantic eel pouts	12	7	1020
<i>Artediellus atlanticus</i>	Atlantic hook-ear sculpin	4	3	53.5
<i>Leptagonus decagonus</i>	Atlantic poacher	203	82	5,898
<i>Anarhichas lupus</i>	Atlantic Wolf fish	9	5	2,424
<i>Gorgonocephalus sp.</i>	Basket star	2,658	142	566,651
Orphiuroidea *	Brittle star *	N/A**	13	452,910
<i>Mallotus villosus</i>	Capelin	913	39	9,865
<i>Gadus morhua</i>	Cod	3,179	243	854,995
<i>Lycenchelys paxillus</i>	Common wolf eelpout	1	1	30
<i>Leptoclinus maculatus</i>	Daubed shanny	8	7	39
<i>Centroscyllium fabricii</i>	Dogfish	3	2	2000
<i>Liparis gibbus</i>	Dusky snail fish	224	41	17,602
<i>Enchelyopus cimbrius</i>	Four bearded rocking	33	18	1,530
<i>Eumesogrammus praecisus</i>	Four-line snake blenny	45	27	2,079
<i>Myoxocephalus aeneus</i>	Grubby sculpin	13	5	1000
<i>Melanogrammus aeglefinus</i>	Haddock	12	3	4,130
<i>Hippoglossus hippoglossus</i>	Halibut	10	8	54,930
<i>Pagurus sp.</i>	Hermit Crab	693	126	22,420

Scientific name	Common name	Catch in number	Number of grids	Total weight (g)
<i>Clupea harengus</i>	Herring	368	7	49180
<i>Hyas araneus</i>	Toad crab	397	82	59,953
<i>Hyas coarctatus</i>	Toad crab	794	140	69,906
<i>Clinocardium islandicum</i>	Iceland clam	498	22	19,516
<i>Atolla</i> sp.	Jellyfish	17	9	14,670
<i>Lycodes lavalaei</i>	Laval eelpout	126	71	51,050
<i>Homarus americanus</i>	Lobster	55	3	18,230
<i>Phycis chesteri</i>	Long-fin hake	78	5	6,264
<i>Myoxocephalus octodecemspinosus</i>	Long-horn sculpin	224	36	27,153
<i>Cyclopterus lumpus</i>	Lump-fish	9	9	793
<i>Lophius americanus</i>	Monkfish	5	5	11,080
<i>Triglops murrayi</i>	Moustache sculpin	95	46	1,743
<i>Lithodes maja</i>	Northern stone crab	133	27	42,513
<i>Zoarces americanus</i>	Ocean pout	9	6	1,228
<i>Rossia megaptera</i>	Octopus	9	6	261
<i>Cyrtodaria siliqua</i>	Pilot	92	5	1,806
<i>Arctica islandica</i>	Quahog	34	11	2,011
<i>Sebastes</i> sp.	Redfish	1,166	64	180,855
<i>Gadus ogac</i>	Rock Cod	12	9	4,420
<i>Cancer irroratus</i>	Rock Crab	30	8	3,603
<i>Nezumia bairdii</i>	Round-nose Grenadier	427	20	16,939
<i>Echinarachnius parma</i>	Sand Dollar	9,010	86	159,139
<i>Ammodytes</i> sp.	Sand Lance	26	6	263
<i>Placopecten magellanicus</i>	Scallop	72	23	9,040
Holothuroidea *	Sea Cucumber *	730	73	305,173

Scientific name	Common name	Catch in number	Number of grids	Total weight (g)
<i>Aphrodita hastate</i>	Sea Mouse	170	17	5,575
<i>Pennatula sp.</i>	Sea pen	3,600	3	5,400
<i>Boltenia ovifera</i>	Sea Potato	1,932	83	203,927
<i>Hemitripterus americanus</i>	Sea Raven	31	18	7,210
<i>Careproctus reinhardti</i>	Sea tadpole	1	1	50
<i>Strongylocentrotus sp.</i>	Sea Urchin	16,669	213	627,271
<i>Polychaeta</i>	Sea Worm	1	1	60
<i>Myoxocephalus scorpius</i>	Short-horn sculpin	144	62	31713
Decapoda	Shrimp*	18,436	120	73,683
<i>Merluccius bilinearis</i>	Silver hake	49	17	9,650
<i>Rajidae</i> egg case	Skate egg	512	13	4,356
<i>Malacoraja senta</i>	Smooth Skate	141	32	60,096
<i>Lumpenus lampretaeformis</i>	Snake blenny	119	30	1,877
<i>Chionoecetes opilio</i>	Snow crab	21,621	320	N/A
<i>Icelus spatula</i>	Spatulate sculpin	64	31	1,789
<i>Eumicrotremus spinosus</i>	Spiny lump sucker	16	15	639
Porifera	Sponge	195	38	70,520
<i>Anarhichas minor</i>	Spotted wolf-fish	1	1	280
<i>Illex illecebrosus</i>	Squid	2	2	246
<i>Asteroidea</i>	Starfish*	16,447	281	514,889
<i>Amblyraja radiata</i>	Thorny skate	394	72	120,008
<i>Reinhardtius hippoglossoides</i>	Turbot	51	22	33,042
<i>Icelus bicornis</i>	Two-horn Sculpin	105	32	2,581
<i>Lycodes vahlii</i>	Vahl's eelpout	9	6	535
<i>Buccinidae</i> *	Whelk*	879	156	29,999

Scientific name	Common name	Catch in number	Number of grids	Total weight (g)
<i>Buccinidae egg *</i>	Whelk egg	118	36	7,161
<i>Urophycis tenuis</i>	White hake	289	26	88,770
<i>Pseudopleuronectes americanus</i>	Winter flounder	223	13	27,218
<i>Leucoraja ocellata</i>	Winter skate	28	15	19,940
<i>Glyptocephalus cynoglossus</i>	Witch flounder	765	72	201,820
<i>Lycenchelys verrillii</i>	Wolf eelpout	3	2	240
<i>Cryptacanthodes maculatus</i>	Wrymouth	2	1	210
<i>Limanda ferruginea</i>	Yellowtail	2,165	100	132,066

* Sea anemones, brittle stars, sea cucumbers, shrimp, sponges, starfish, and whelks were not identified to species.

** The catch of brittle stars was not counted.

FIGURES



Figure 1. Snow crab bottom trawl survey grid sampling design for the southern Gulf of St. Lawrence in 2013. There are a total of 355 sampling grids defined by squares measuring 12.7 by 12.7 kilometres. The three stations in red symbols are untrawlable stations.

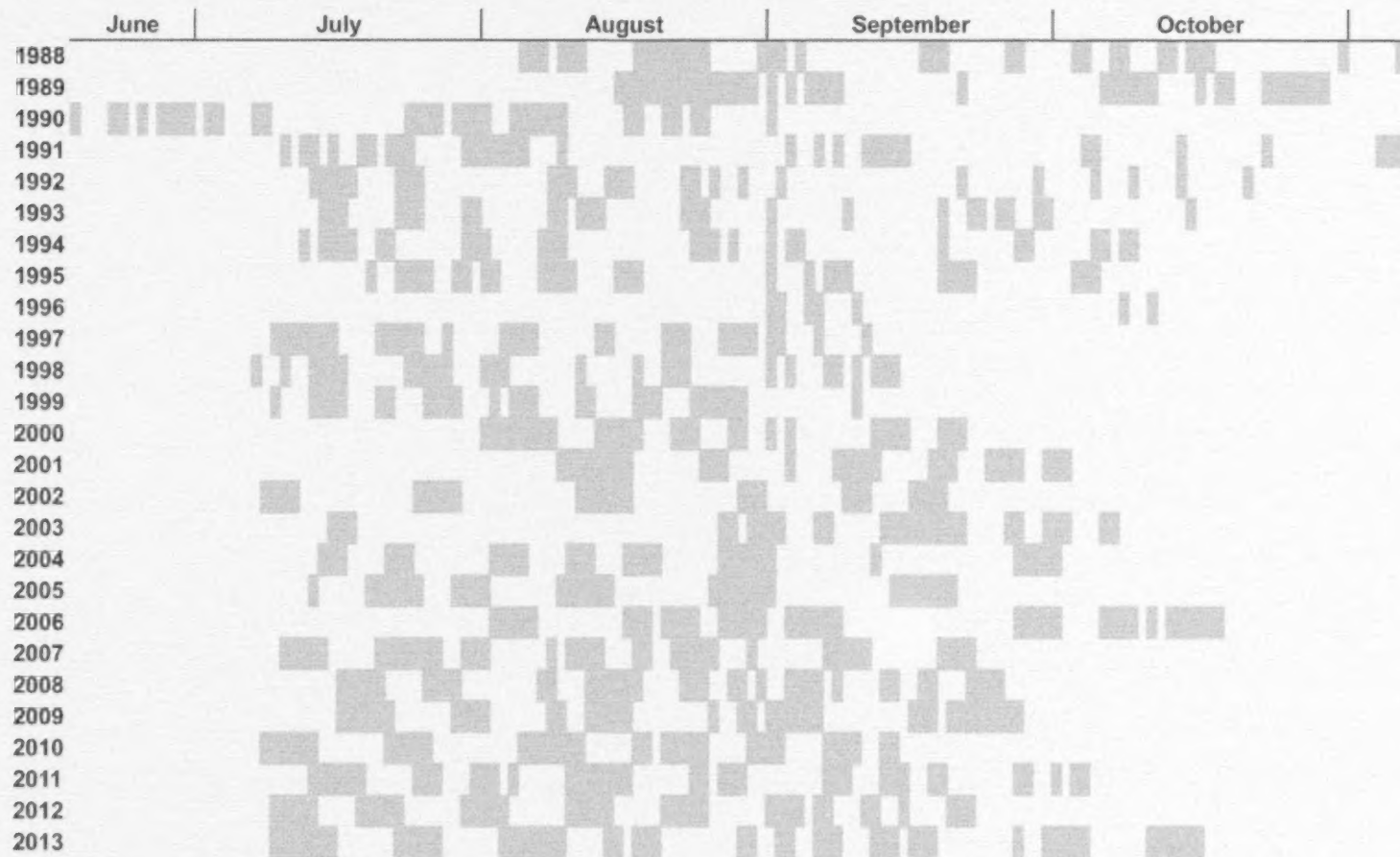


Figure 2: Historic information of the timing and duration of snow crab/multi-species survey, 1988 to 2013. Shaded cells are days when the vessel was at sea.

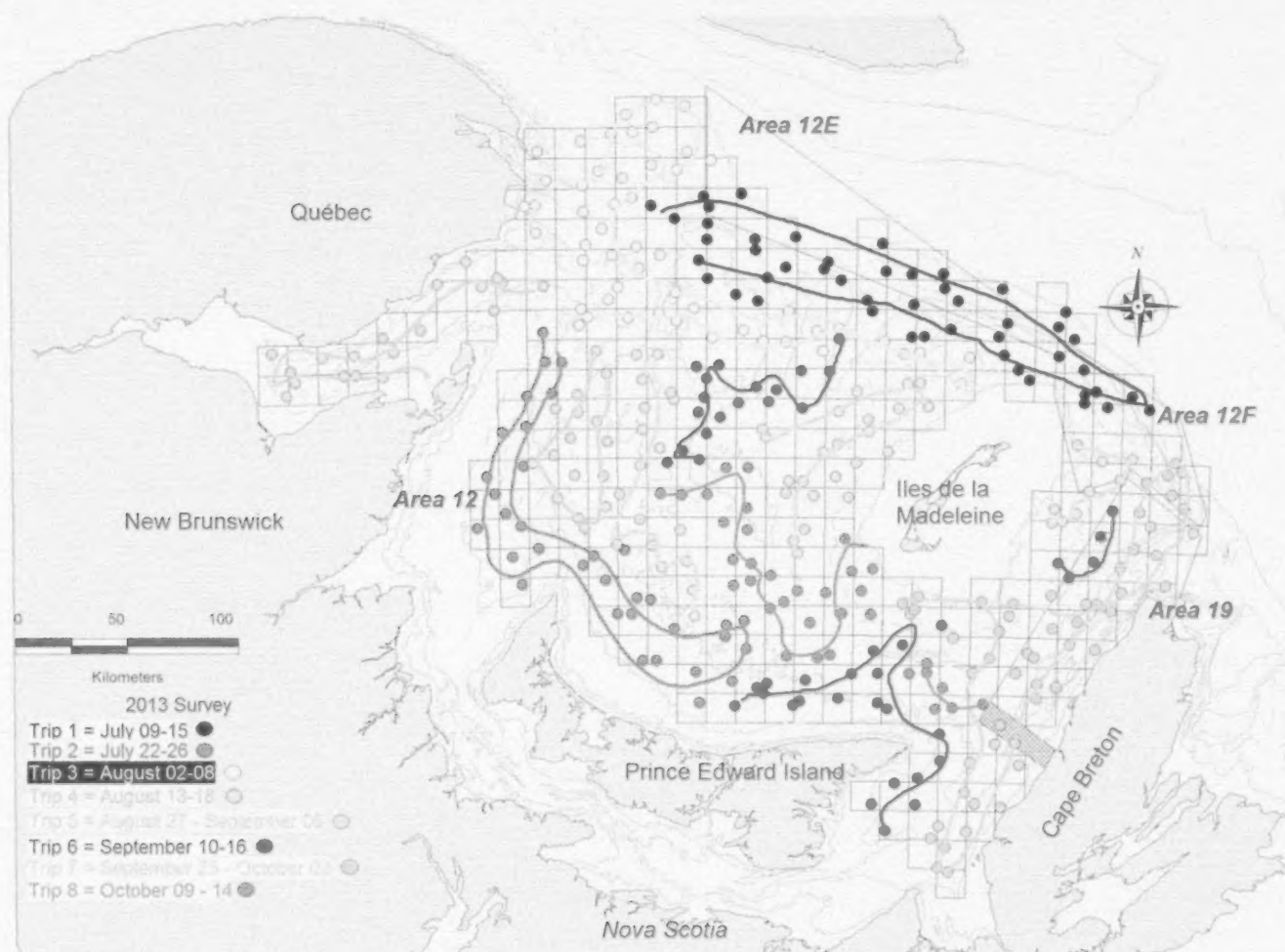


Figure 3. Sequence of stations sampled by trip during the 2013 snow crab/multi-species survey.

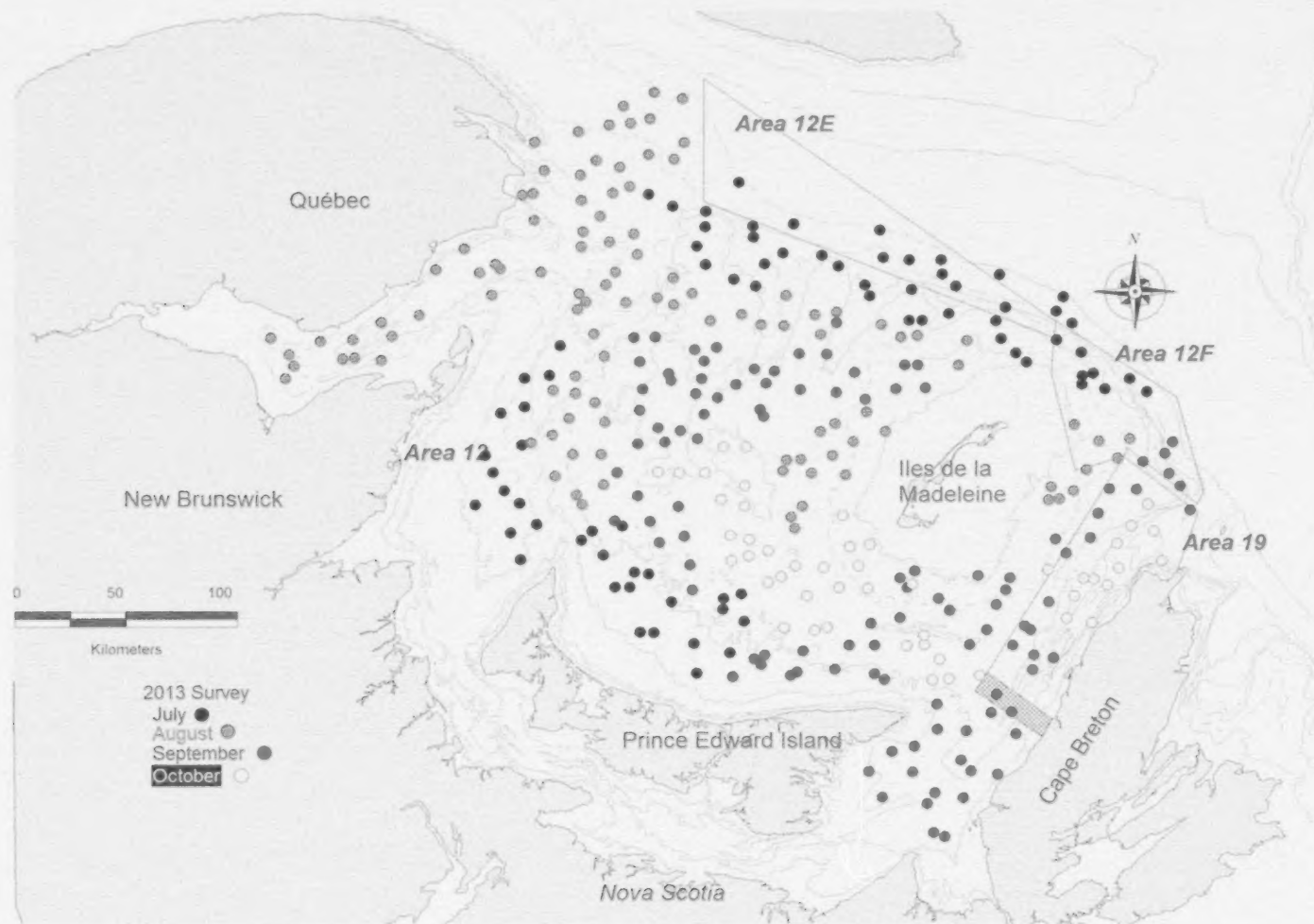


Figure 4. Geographic distribution of stations trawled by month during the 2013 snow crab / multi-species survey.

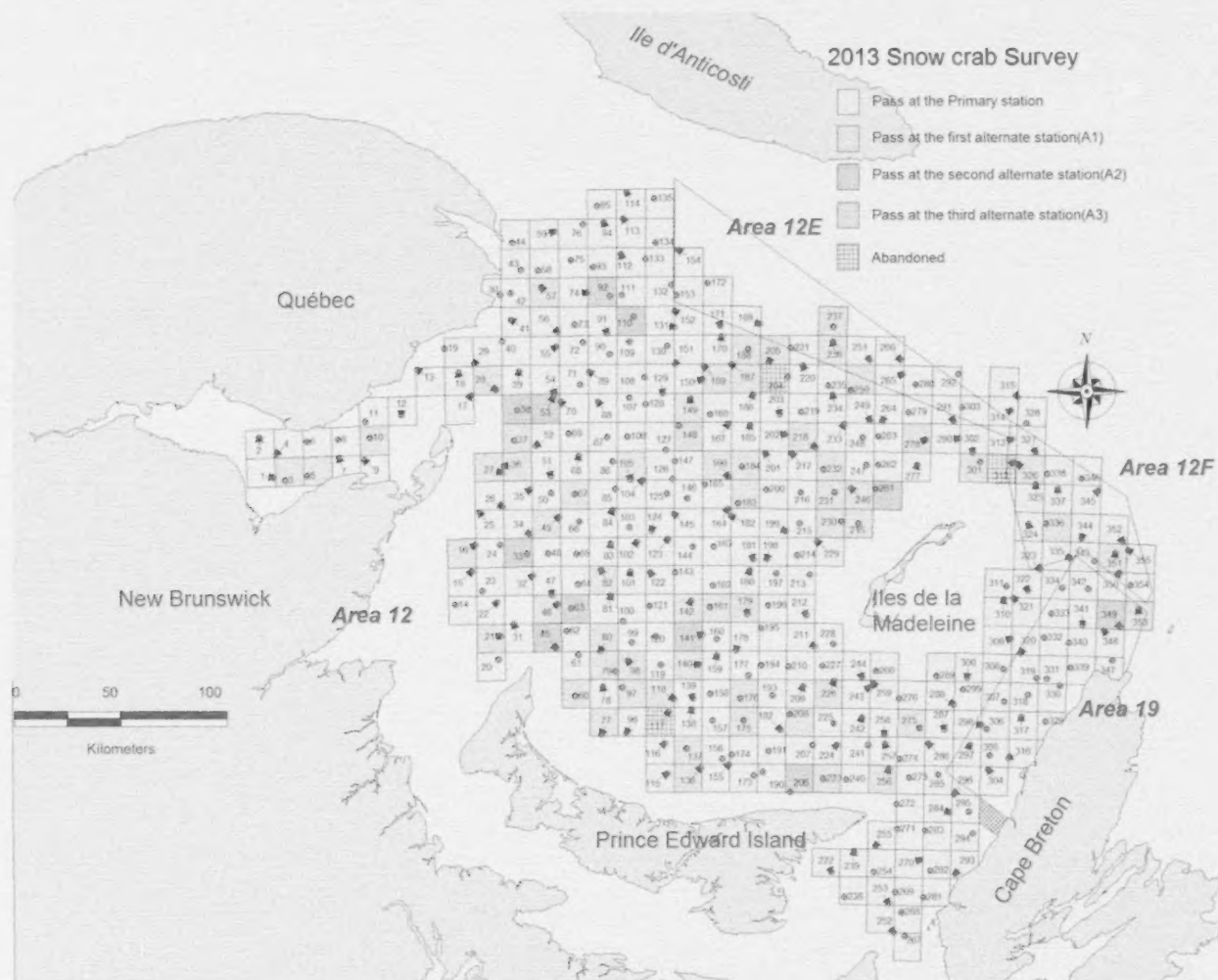


Figure 5. Geographic distribution of survey stations by tow quality during the 2013 snow crab / multi-species survey.

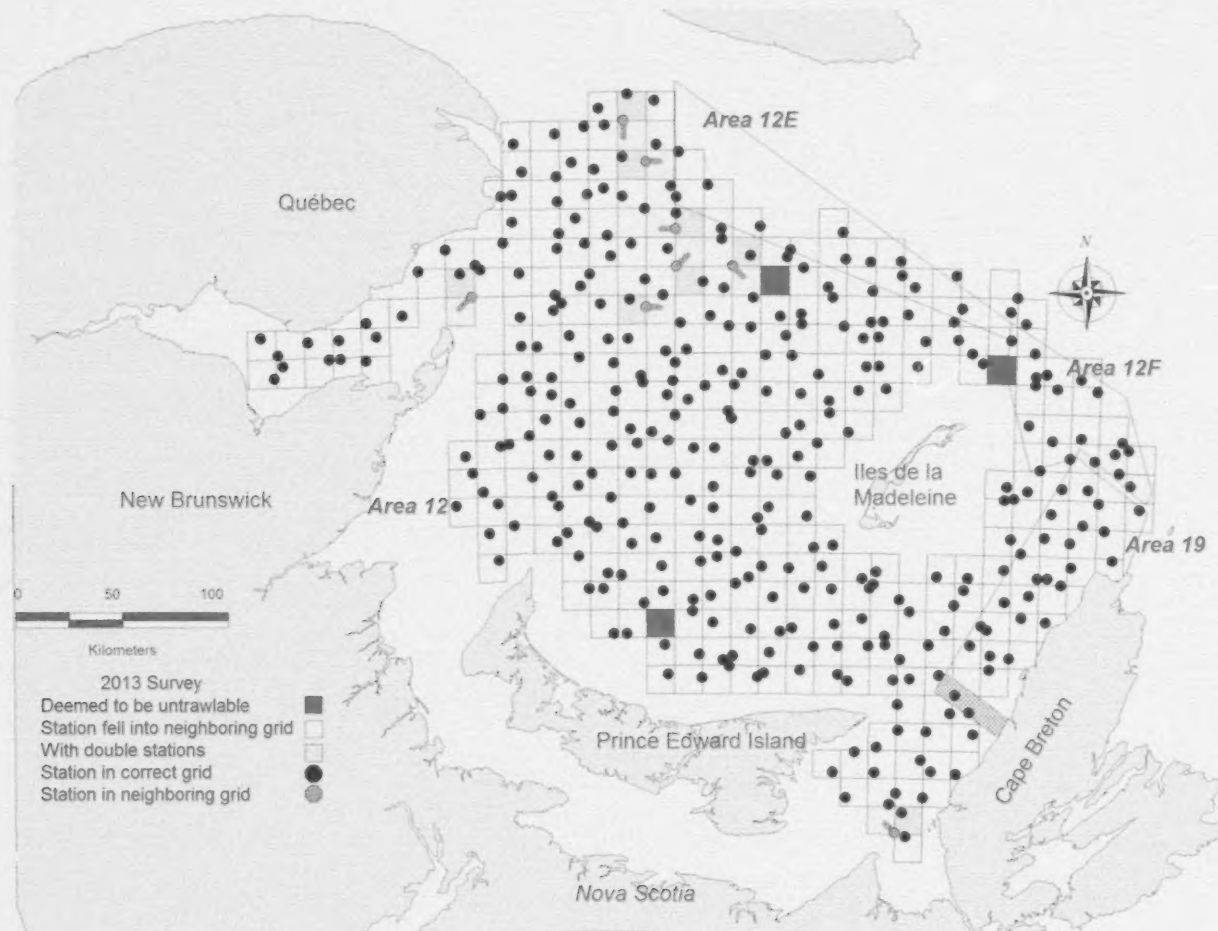


Figure 6. Geographic position of sampling stations within the sampling grids. A total of three grids were deemed to be untrawlable at the stations sampled. There were eight vacant grids (grid with no trawl station) and subsequently eight grids containing 2 trawl stations due to vessel drift between the arrival at station and completion of the trawl sample.

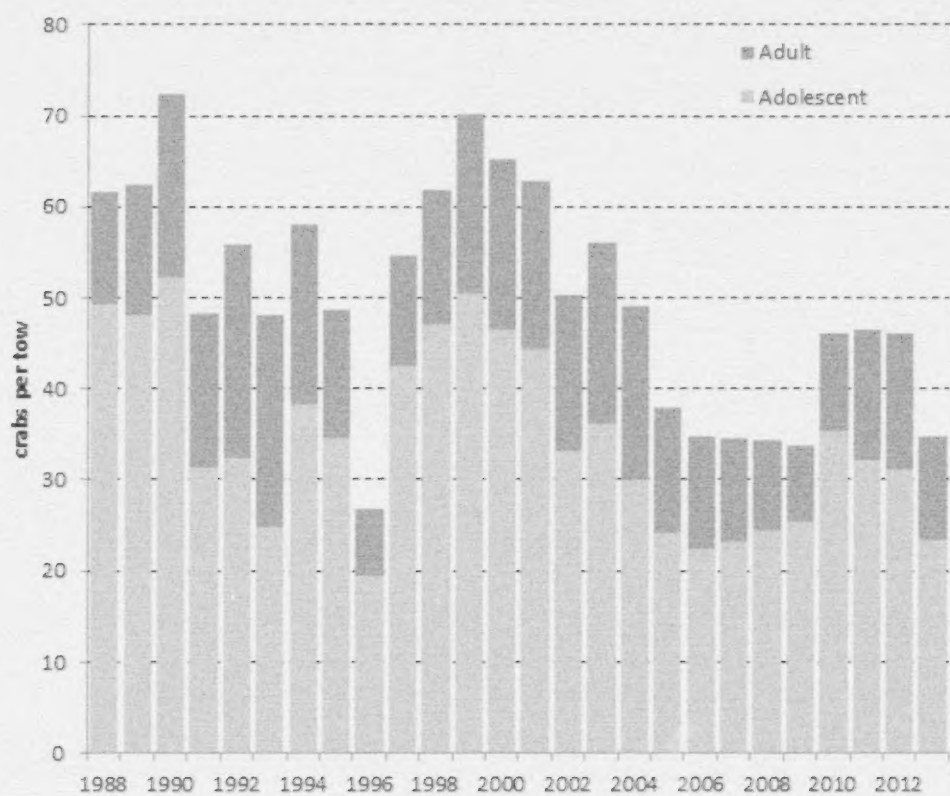


Figure 7. Time series of mean number of male snow crabs per tow by maturity stage (adult, adolescent) sampled during the 1988 to 2013 snow crab / multi-species survey.

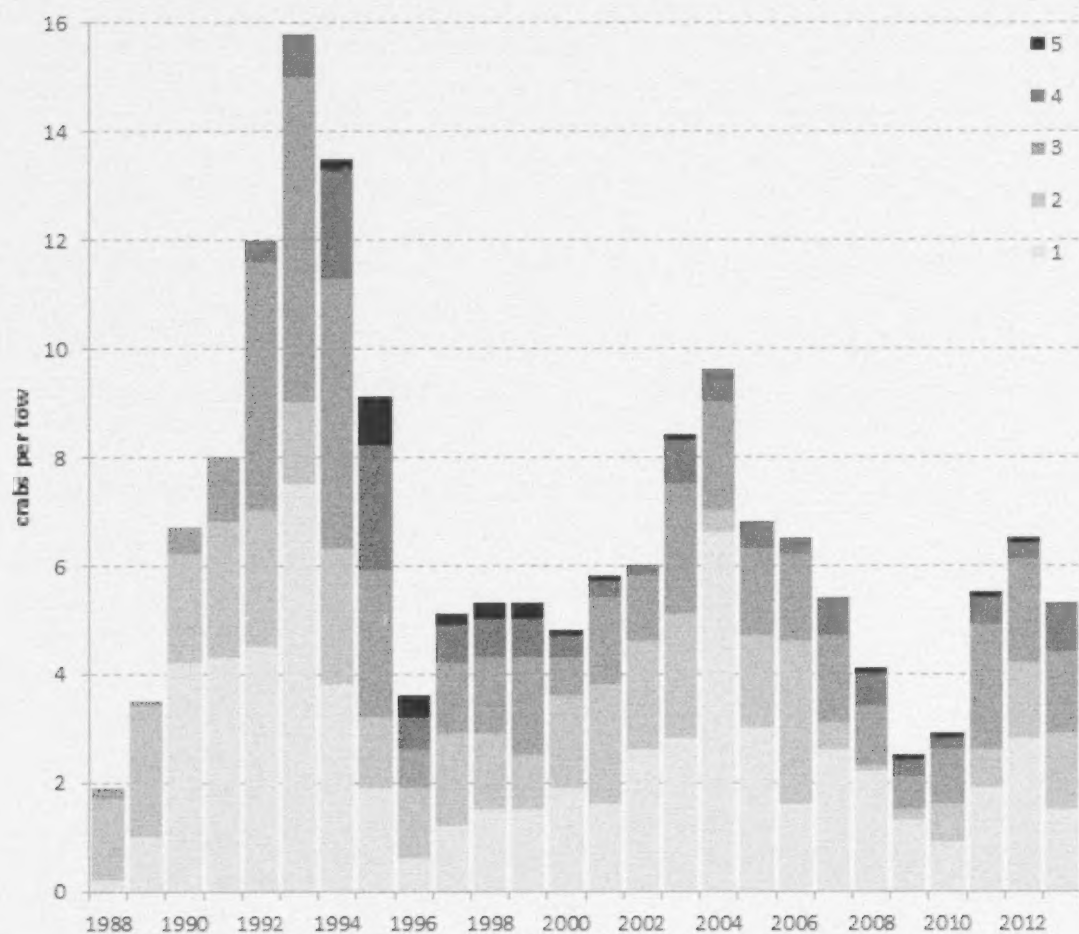


Figure 8. Time series of mean number of commercial-sized adult male snow crabs per tow by carapace condition sampled during the 1988 to 2013 snow crab / multi-species survey.

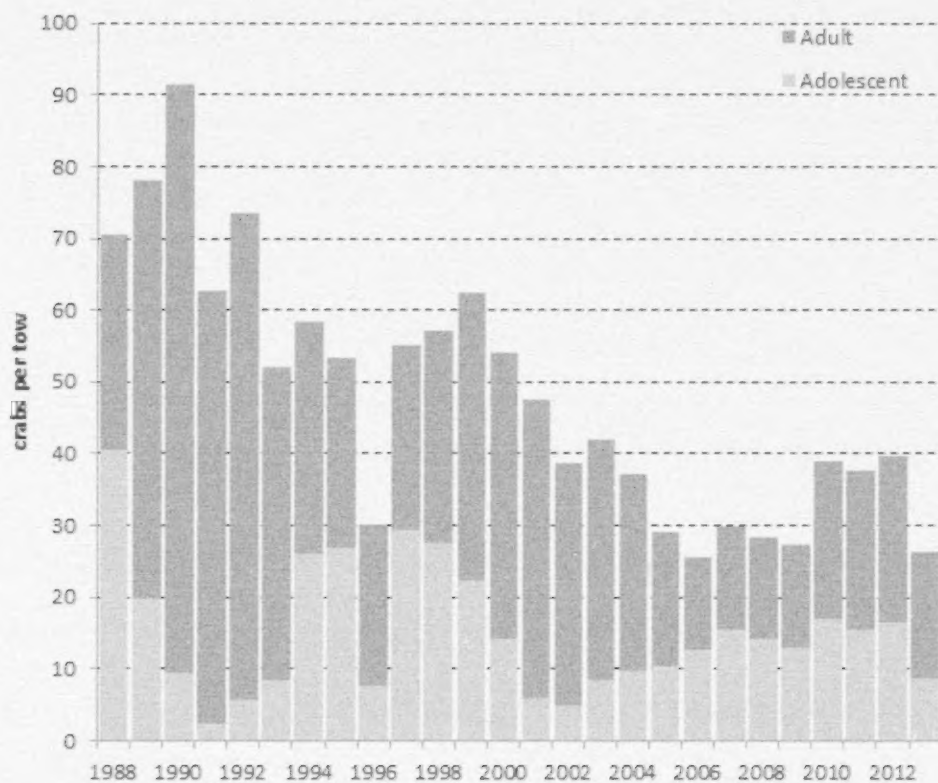


Figure 9. Time series of mean number of female snow crabs per tow by maturity stage (adult, adolescent) sampled during the 1988 to 2013 snow crab / multi-species survey.

APPENDIX

Appendix 1: Individual trawl sample details for 2013 sorted by tow quality and date. The information summarized includes: date, sequential daily tow number, position (Latitude, Longitude), swept area estimate (AS; m²), depth (m) of station, bottom temperature (T; °C) at station, catches in number and estimated weight of commercial-sized adult male snow crab of carapace condition 1 and 2 (rC/tow and rW/tow, respectively), catches in number and estimated weight of commercial-sized adult male snow crab of carapace conditions 3, 4 and 5 (RC/tow and RW/tow, respectively), and tow quality indicator (TQ).*

**Tow quality indicator represents: 1 = successful trawl sample and acceptable area swept data; 2 = successful trawl sample, and the area swept data was estimated by the average area swept of 10 neighboring stations; 3 = original trawl set unsuccessful, repeated successful tow at alternative station and acceptable area swept data; 4 = original trawl set unsuccessful, repeated successful tow at alternative station and the area swept data was estimated by the average area swept of 10 neighboring stations.*

Date (dd-mm-yyyy)	Tow number	Latitude	Longitude	AS (m ²)	Depth (m)	T (°C)	rC/tow (number)	rW/tow (kg)	RC/tow (number)	RW/tow (kg)	TQ*
09-07-2013	4	48.4772	-63.1275	3263	85.95	0.8	0	0	0	0	1
09-07-2013	5	48.4164	-63.1307	2747	54.86	1.1	6	2.584	2	0.770	1
09-07-2013	6	48.3379	-63.1787	2963	54.86	1	5	2.087	0	0	1
09-07-2013	7	48.2666	-63.1281	2192	51.21	1	8	3.691	1	0.477	1
09-07-2013	8	48.2068	-62.9658	2877	73.15	0.7	7	2.862	5	2.102	1
10-07-2013	11	48.0435	-61.9561	2247	62.18	0.7	2	1.383	2	1.383	1
10-07-2013	12	48.0441	-61.8837	2693	62.18	0.8	2	0.773	2	0.773	1
10-07-2013	6	48.2594	-62.3635	3230	71.32	0.3	1	0.445	0	0	1
10-07-2013	8	48.1423	-62.1841	3622	89.61	0.04	12	6.342	12	6.342	1
11-07-2013	1	48.072	-61.7312	2687	84.12	1.1	5	2.331	5	2.331	1
12-07-2013	1	48.0812	-61.1147	2152	301.75	5.8	0	0	0	0	1

Date (dd-mm-yyyy)	Tow number	Latitude	Longitude	AS (m ²)	Depth (m)	T (°C)	rC/tow (number)	rW/tow (kg)	RC/tow (number)	RW/tow (kg)	TQ*
12-07-2013	2	48.1379	-61.0741	2405	358.44	5.6	0	0	0	0	1
12-07-2013	3	48.0328	-61.0222	2665	287.12	5.9	0	0	0	0	1
12-07-2013	10	47.788	-60.9656	2304	54.86	1.6	9	7.783	0	0	1
12-07-2013	4	47.9675	-61.1103	2633	82.3	0.7	0	0	0	0	1
12-07-2013	5	47.9159	-60.9679	2605	85.95	1.1	0	0	0	0	1
12-07-2013	6	47.8318	-60.898	2392	74.98	1	1	0.446	1	0.446	1
12-07-2013	7	47.8114	-60.6896	2521	195.68	3.8	0	0	0	0	1
12-07-2013	8	47.7601	-60.5914	2508	234.09	5.6	0	0	0	0	1
12-07-2013	9	47.7705	-60.8319	2324	69.49	1.4	1	0.593	1	0.593	1
13-07-2013	10	48.0426	-61.4583	2358	67.67	1.1	1	0.877	0	0	1
13-07-2013	9	47.971	-61.4283	2902	60.35	1.3	0	0	0	0	1
13-07-2013	11	48.0954	-61.4054	2769	95.1	1.1	0	0	0	0	1
13-07-2013	12	48.2268	-61.438	2930	365.76	5.6	0	0	0	0	1
14-07-2013	1	48.1815	-61.6897	1338	120.7	2.3	0	0	0	0	1
14-07-2013	2	48.2286	-61.7684	2259	256.03	5.8	0	0	0	0	1
14-07-2013	3	48.2843	-61.776	2583	340.16	5	0	0	0	0	1
14-07-2013	4	48.2835	-61.9567	1988	237.74	5.6	0	0	0	0	1
15-07-2013	4	48.3755	-62.8543	3133	95.1	1	2	0.974	2	0.974	1

Date (dd-mm-yyyy)	Tow number	Latitude	Longitude	AS (m ²)	Depth (m)	T (°C)	rC/tow (number)	rW/tow (kg)	RC/tow (number)	RW/tow (kg)	TQ*
15-07-2013	9	48.5452	-63.455	2520	128.02	2.5	0	0	0	0	1
15-07-2013	6	48.5907	-62.9373	2304	363.93	5.6	0	0	0	0	1
22-07-2013	11	47.6993	-64.1653	1985	71.32	1	9	5.254	4	2.217	1
22-07-2013	12	47.6742	-64.3014	2259	51.21	2.2	2	0.946	1	0.385	1
22-07-2013	6	47.9438	-63.9628	2190	89.61	0.5	0	0	0	0	1
23-07-2013	1	47.5455	-64.1785	2701	64.01	0.2	11	6.992	2	0.935	1
23-07-2013	11	47.0834	-64.1858	2535	40.23	3.5	0	0	0	0	1
23-07-2013	4	47.4357	-64.3442	2966	54.86	0.2	15	8.745	0	0	1
23-07-2013	5	47.3034	-64.4447	2009	42.06	1.4	0	0	0	0	1
23-07-2013	6	47.3613	-64.2806	1982	53.04	1	8	4.088	0	0	1
23-07-2013	7	47.3125	-64.1928	2449	47.55	0.8	3	1.837	0	0	1
23-07-2013	8	47.225	-64.0932	3003	38.4	2.8	0	0	0	0	1
24-07-2013	4	47.1972	-63.7756	2830	54.86	1	5	3.104	0	0	1
24-07-2013	5	47.101	-63.7091	2959	54.86	0.1	2	0.988	0	0	1
25-07-2013	1	46.9709	-63.5592	2113	47.55	3.2	2	1.335	0	0	1
25-07-2013	11	46.8323	-62.9009	2628	60.35	0.2	10	5.270	1	0.405	1
25-07-2013	12	46.8804	-63.0223	2372	60.35	0.2	3	1.234	0	0	1
25-07-2013	6	46.7864	-63.4175	1988	43.89	4	0	0	0	0	1

Date (dd-mm-yyyy)	Tow number	Latitude	Longitude	AS (m ²)	Depth (m)	T (°C)	rC/tow (number)	rW/tow (kg)	RC/tow (number)	RW/tow (kg)	TQ*
25-07-2013	7	46.7416	-63.1898	2446	47.55	0.8	0	0	0	0	1
25-07-2013	8	46.6202	-63.1702	2117	43.89	4	0	0	0	0	1
26-07-2013	1	46.9426	-62.9161	2436	60.35	-0.1	13	7.334	3	1.511	1
26-07-2013	2	46.9248	-63.0182	2756	62.18	0.2	12	6.350	7	3.533	1
02-08-2013	1	47.8659	-61.6743	2448	54.86	1.3	6	4.232	0	0	1
03-08-2013	1	47.9841	-61.9106	2853	58.52	0.7	12	6.503	11	6.122	1
03-08-2013	10	48.0695	-62.9214	2196	65.84	0.2	2	0.835	1	0.372	1
03-08-2013	2	47.9782	-62.0039	2455	58.52	0.8	1	0.653	0	0	1
03-08-2013	4	48.0777	-62.3743	2725	74.98	0.5	6	3.003	6	3.003	1
03-08-2013	5	47.9898	-62.4673	2889	69.49	0.5	7	3.032	6	2.628	1
03-08-2013	6	48.0675	-62.5013	2784	58.52	0.8	3	1.464	1	0.434	1
03-08-2013	7	48.0239	-62.6764	3239	87.78	1.9	11	5.598	5	2.523	1
03-08-2013	8	48.1436	-62.665	3636	98.76	2.2	17	7.471	11	4.867	1
04-08-2013	4	48.1072	-63.3088	2827	71.32	0.4	7	4.139	2	0.775	1
04-08-2013	5	48.2143	-63.3148	3706	95.1	1.1	20	9.469	10	4.396	1
04-08-2013	7	48.1175	-63.584	3295	89.61	1.6	10	5.476	6	3.255	1
04-08-2013	8	48.119	-63.8158	3386	85.95	0.8	7	3.885	0	0	1
05-08-2013	10	48.4575	-63.7347	2067	155.45	3.1	10	7.106	4	2.162	1

Date (dd-mm-yyyy)	Tow number	Latitude	Longitude	AS (m ²)	Depth (m)	T (°C)	rC/tow (number)	rW/tow (kg)	RC/tow (number)	RW/tow (kg)	TQ*
05-08-2013	2	48.1877	-63.7002	2057	102.41	1.6	4	1.915	1	0.357	1
05-08-2013	3	48.2364	-63.6459	2677	102.41	1.7	6	3.342	2	1.255	1
05-08-2013	4	48.3079	-63.5209	3474	96.93	1.7	1	0.791	1	0.791	1
05-08-2013	6	48.3893	-63.5408	3671	109.73	2.2	11	6.675	4	2.074	1
05-08-2013	7	48.3567	-63.6785	3155	87.78	0.8	1	0.465	1	0.465	1
06-08-2013	1	48.4421	-64.1157	3661	69.49	1.3	1	0.771	0	0	1
06-08-2013	2	48.5425	-64.1817	2444	78.64	1.1	19	14.431	3	1.585	1
27-08-2013	5	47.433	-62.5181	3457	74.98	0.5	25	12.864	14	6.820	1
27-08-2013	6	47.4417	-62.6788	2559	64.01	0.5	2	0.862	1	0.358	1
27-08-2013	7	47.4872	-62.6597	2620	58.52	0.5	2	1.045	0	0	1
27-08-2013	8	47.4879	-62.5783	2841	65.84	0.7	6	2.798	5	2.348	1
27-08-2013	9	47.5051	-62.3935	2395	60.35	0.5	0	0	0	0	1
28-08-2013	10	47.3259	-61.1522	2075	47.55	2.2	2	1.280	2	1.280	1
28-08-2013	5	47.4921	-60.7573	2594	54.86	1.4	4	2.494	4	2.494	1
28-08-2013	6	47.447	-60.9376	2231	47.55	1.6	4	2.899	1	0.572	1
28-08-2013	7	47.3614	-61.0121	2681	53.04	1.7	5	2.762	5	2.762	1
28-08-2013	8	47.3302	-61.0936	2017	51.21	2.2	2	1.130	0	0	1
28-08-2013	1	47.6282	-61.0067	2161	38.4	2.5	0	0	0	0	1

Date (dd-mm-yyyy)	Tow number	Latitude	Longitude	AS (m ²)	Depth (m)	T (°C)	rC/tow (number)	rW/tow (kg)	RC/tow (number)	RW/tow (kg)	TQ*
28-08-2013	4	47.5714	-60.6893	2549	56.69	1.4	0	0	0	0	1
31-08-2013	1	47.6328	-62.381	2617	54.86	0.7	6	3.014	2	1.149	1
01-09-2013	3	47.8668	-61.908	2896	54.86	0.8	31	17.262	2	1.296	1
01-09-2013	4	47.8659	-61.9811	2791	54.86	1.1	5	3.026	1	0.461	1
01-09-2013	9	47.7577	-62.3752	2396	65.84	0.7	3	1.400	2	0.833	1
04-09-2013	1	47.6602	-62.7919	2771	58.52	0.2	5	3.019	3	1.481	1
05-09-2013	10	47.5498	-63.5124	2946	71.32	0.5	18	9.353	7	3.201	1
05-09-2013	2	47.977	-63.5366	3069	74.98	0.8	3	1.473	1	0.505	1
05-09-2013	3	47.8801	-63.5025	2636	64.01	0.8	5	2.364	4	1.621	1
05-09-2013	4	47.8044	-63.3232	3371	78.64	0.8	13	7.512	5	2.334	1
05-09-2013	7	47.7703	-63.4869	3283	74.98	0.5	10	5.409	2	0.909	1
05-09-2013	9	47.6157	-63.3995	3665	78.64	0.4	12	6.426	7	3.318	1
06-09-2013	3	47.3403	-63.5142	3414	69.49	0.2	19	10.141	5	2.268	1
06-09-2013	4	47.2373	-63.4427	3221	54.86	0.4	0	0	0	0	1
06-09-2013	6	47.1523	-63.3883	2886	56.69	-0.3	2	1.430	0	0	1
10-09-2013	1	46.2162	-62.1829	2195	32.92	5.2	0	0	0	0	1
10-09-2013	2	46.1109	-62.1045	2599	38.4	2.8	0	0	0	0	1
10-09-2013	4	46.2994	-62.0491	1969	40.23	4.3	0	0	0	0	1

Date (dd-mm-yyyy)	Tow number	Latitude	Longitude	AS (m ²)	Depth (m)	T (°C)	rC/tow (number)	rW/tow (kg)	RC/tow (number)	RW/tow (kg)	TQ ^a
11-09-2013	1	46.3195	-61.9188	2054	40.23	5.3	0	0	0	0	1
11-09-2013	10	46.6249	-62.5956	2562	47.55	0.8	0	0	0	0	1
11-09-2013	2	46.3897	-61.7893	2716	40.23	5.2	0	0	0	0	1
11-09-2013	3	46.4932	-61.7928	2494	42.06	5.3	0	0	0	0	1
11-09-2013	4	46.5937	-62.0938	2707	49.38	1.7	0	0	0	0	1
12-09-2013	10	46.8459	-62.0054	2752	64.01	0.4	15	9.321	11	6.990	1
12-09-2013	11	46.924	-61.783	2492	51.21	1	0	0	0	0	1
12-09-2013	3	46.6545	-62.8021	2838	51.21	0.7	0	0	0	0	1
12-09-2013	4	46.6789	-62.8413	2397	49.38	0.2	0	0	0	0	1
12-09-2013	5	46.6945	-62.7818	2618	51.21	0.4	0	0	0	0	1
12-09-2013	6	46.7097	-62.5622	2704	54.86	0.4	0	0	0	0	1
12-09-2013	7	46.7329	-62.2979	3331	64.01	0.2	5	2.772	0	0	1
12-09-2013	8	46.7343	-62.1506	2753	64.01	0.4	1	0.471	0	0	1
12-09-2013	9	46.8229	-62.1725	3543	78.64	0.5	37	20.138	31	16.729	1
14-09-2013	1	47.1661	-61.114	3156	58.52	1.4	5	3.427	5	3.427	1
14-09-2013	2	47.1082	-61.0532	3403	76.81	1.6	16	10.754	13	8.947	1
14-09-2013	3	47.1708	-60.9121	3140	82.3	1.7	3	1.553	3	1.553	1
14-09-2013	4	47.2695	-60.8704	3681	84.12	1.4	35	21.674	30	17.986	1

Date (dd-mm-yyyy)	Tow number	Latitude	Longitude	AS (m ²)	Depth (m)	T (°C)	rC/tow (number)	rW/tow (kg)	RC/tow (number)	RW/tow (kg)	TQ*
14-09-2013	5	47.37	-60.804	2396	62.18	1.6	4	2.628	3	1.772	1
15-09-2013	11	47.7894	-62.9503	3187	73.15	0.4	1	0.893	0	0	1
15-09-2013	3	47.9106	-62.428	3073	74.98	0.7	5	2.031	5	2.031	1
15-09-2013	4	47.9127	-62.5894	2538	62.18	0.5	1	0.487	0	0	1
15-09-2013	5	47.768	-62.5829	2365	65.84	0.5	0	0	0	0	1
16-09-2013	10	47.5702	-63.1728	2875	65.84	0.2	11	5.211	5	2.160	1
16-09-2013	11	47.6041	-63.2693	3142	85.95	0.4	39	20.693	32	16.615	1
16-09-2013	4	47.9286	-63.1888	2257	64.01	0.5	39	20.368	2	0.991	1
16-09-2013	5	47.8827	-63.1325	3093	69.49	0.4	3	1.805	2	0.815	1
16-09-2013	6	47.811	-63.1467	3224	73.15	0.5	3	1.498	1	0.375	1
16-09-2013	8	47.7357	-63.0546	3427	73.15	0.2	5	2.547	4	1.992	1
25-09-2013	1	46.7373	-61.6051	3749	73.15	0.7	23	13.299	16	8.742	1
25-09-2013	10	47.0087	-62.0053	2375	49.38	0.7	2	1.107	0	0	1
25-09-2013	11	46.969	-61.963	2869	49.38	0.5	0	0	0	0	1
25-09-2013	4	46.7959	-61.5076	3151	64.01	1.1	16	9.738	15	9.071	1
25-09-2013	5	46.8995	-61.4531	2815	60.35	0.7	9	5.008	3	1.685	1
25-09-2013	6	46.9596	-61.397	2926	51.21	0.7	13	7.899	5	2.473	1
25-09-2013	7	47.0093	-61.373	2190	45.72	0.8	1	0.677	0	0	1

Date (dd-mm-yyyy)	Tow number	Latitude	Longitude	AS (m ²)	Depth (m)	T (°C)	rC/tow (number)	rW/tow (kg)	RC/tow (number)	RW/tow (kg)	TQ ^a
25-09-2013	8	47.0166	-61.5567	2226	32.92	3.1	0	0	0	0	1
28-09-2013	1	45.9474	-61.7448	1859	40.23	7.6	4	2.898	0	0	1
28-09-2013	10	46.3827	-61.6207	3100	54.86	1.3	38	28.253	11	8.324	1
28-09-2013	4	46.0839	-61.8446	1761	49.38	2.5	2	1.306	1	0.358	1
28-09-2013	5	46.129	-61.8013	1774	49.38	2.2	4	2.871	2	1.409	1
28-09-2013	7	46.2045	-61.4436	2349	42.06	5.3	0	0	0	0	1
28-09-2013	8	46.2183	-61.5931	1808	56.69	1.7	5	3.358	1	0.532	1
29-09-2013	1	46.3712	-61.3379	2330	49.38	2.5	3	2.126	1	0.421	1
29-09-2013	3	46.4575	-61.4782	1752	60.35	0.5	4	2.620	4	2.620	1
29-09-2013	4	46.5323	-61.4478	3236	62.18	0.5	8	5.412	5	3.426	1
29-09-2013	10	46.7979	-61.2553	2944	65.84	1.2	11	7.999	10	7.278	1
29-09-2013	11	46.9117	-61.1501	2839	62.18	0.5	6	4.173	4	2.768	1
29-09-2013	5	46.634	-61.2419	3188	78.64	1.2	17	10.807	9	5.662	1
29-09-2013	6	46.6817	-61.1238	1682	84.12	1.2	5	2.620	5	2.620	1
29-09-2013	7	46.6932	-61.2363	3279	113.39	1.7	31	21.538	23	16.195	1
29-09-2013	8	46.7343	-61.3573	2986	67.67	0.4	21	15.927	17	13.175	1
29-09-2013	9	46.8141	-61.2904	2961	62.18	0.9	10	6.621	7	4.755	1
30-09-2013	1	47.3658	-60.6491	2610	65.84	1.3	3	2.090	0	0	1

Date (dd-mm-yyyy)	Tow number	Latitude	Longitude	AS (m ²)	Depth (m)	T (°C)	rC/tow (number)	rW/tow (kg)	RC/tow (number)	RW/tow (kg)	TQ ^a
30-09-2013	5	47.557	-60.4424	2849	230.43	5.3	0	0	0	0	1
30-09-2013	7	47.4317	-60.4631	2427	96.93	1.7	6	4.225	1	0.662	1
30-09-2013	8	47.3814	-60.396	2328	80.47	1.7	0	0	0	0	1
01-10-2013	1	47.0792	-60.5024	2449	135.33	3.3	9	5.631	8	5.051	1
01-10-2013	2	47.1996	-60.5507	1850	168.25	4.4	1	0.473	1	0.473	1
01-10-2013	5	47.2223	-60.6791	3393	95.1	2	1	0.803	0	0	1
01-10-2013	6	47.1497	-60.7591	2284	157.28	3.6	19	11.185	16	9.482	1
02-10-2013	4	47.0424	-61.1563	2970	58.52	1.2	7	4.465	3	1.920	1
02-10-2013	5	46.9856	-61.9379	2599	45.72	0.2	0	0	0	0	1
02-10-2013	1	46.8278	-60.903	3304	89.61	1.3	7	4.998	6	3.935	1
02-10-2013	2	46.8469	-61.0496	2551	102.41	1.3	11	6.943	8	4.884	1
02-10-2013	3	46.9373	-61.0058	3141	98.76	1.8	21	15.521	13	8.796	1
09-10-2013	1	46.6126	-61.5463	2998	60.35	0.5	1	0.597	1	0.597	1
09-10-2013	2	46.5992	-61.7218	2602	58.52	1	3	1.705	2	0.960	1
09-10-2013	8	46.7346	-61.9684	3533	82.3	0.2	5	2.870	5	2.870	1
10-10-2013	1	46.7967	-62.4964	2511	60.35	0	5	2.898	0	0	1
11-10-2013	1	47.4381	-63.3971	2210	82.3	0.5	40	21.237	13	6.729	1
11-10-2013	2	47.4349	-63.2751	2891	69.49	0.2	9	4.767	3	1.462	1

Date (dd-mm-yyyy)	Tow number	Latitude	Longitude	AS (m ²)	Depth (m)	T (°C)	rC/tow (number)	rW/tow (kg)	RC/tow (number)	RW/tow (kg)	TQ*
11-10-2013	4	47.5394	-63.0207	2511	53.04	0	0	0	0	0	1
11-10-2013	5	47.5396	-62.8933	1652	51.21	0	0	0	0	0	1
11-10-2013	6	47.3832	-62.9007	2368	49.38	0	9	6.442	0	0	1
12-10-2013	10	47.0162	-62.6889	2894	64.01	-0.1	4	1.817	3	1.295	1
12-10-2013	4	47.1659	-62.8736	2842	58.52	-0.3	0	0	0	0	1
12-10-2013	7	47.099	-62.8775	2376	56.69	0	1	0.699	0	0	1
12-10-2013	8	47.1198	-62.7629	3182	64.01	-0.1	0	0	0	0	1
12-10-2013	9	47.0598	-62.6086	2971	64.01	0	3	1.542	3	1.542	1
13-10-2013	4	46.9358	-62.54	3129	64.01	0.2	2	0.916	2	0.916	1
13-10-2013	5	47.0524	-62.4458	3258	64.01	0.2	6	3.609	2	1.248	1
13-10-2013	6	46.9719	-62.3566	2590	60.35	0.2	0	0	0	0	1
13-10-2013	8	47.0597	-62.2454	2435	53.04	0.4	0	0	0	0	1
13-10-2013	9	47.1365	-62.2973	2453	51.21	0.2	3	2.168	0	0	1
14-10-2013	1	47.263	-62.3379	2125	53.04	0.2	0	0	0	0	1
10-07-2013	7	48.184	-62.2118	2559.8	85.95	0.5	6	2.549	6	2.549	2
13-07-2013	8	47.9154	-61.3437	2546.5	56.69	1.1	0	0	0	0	2
14-07-2013	9	48.3318	-62.4415	2819.7	157.28	3.8	0	0	0	0	2
15-07-2013	5	48.4173	-62.8572	2738.5	162.76	4.1	0	0	0	0	2

Date (dd-mm-yyyy)	Tow number	Latitude	Longitude	AS (m ²)	Depth (m)	T (°C)	rC/tow (number)	rW/tow (kg)	RC/tow (number)	RW/tow (kg)	TQ*
15-07-2013	8	48.5863	-63.1615	2665.8	223.11	5.2	4	1.807	4	1.807	2
15-07-2013	1	48.4264	-62.6234	2692	320.04	5.6	0	0	0	0	2
15-07-2013	7	48.543	-63.1277	2793.9	226.77	4.7	0	0	0	0	2
03-08-2013	3	48.0278	-62.1164	2745	58.52	0.7	0	0	0	0	2
03-08-2013	9	48.0287	-62.8096	2779.8	84.12	1.1	19	9.462	6	3.063	2
04-08-2013	3	48.153	-63.206	2708.2	73.15	0.5	7	3.917	2	1.217	2
04-08-2013	6	48.1354	-63.406	2851.7	111.56	1.9	16	7.849	6	2.66	2
05-08-2013	1	48.1516	-63.8532	2802.1	64.01	0.7	6	3.380	2	0.947	2
05-08-2013	5	48.3585	-63.3993	3006.6	85.95	2.3	1	0.415	1	0.415	2
05-08-2013	8	48.3382	-63.8428	3029.6	107.9	2.2	19	11.511	4	1.669	2
05-08-2013	9	48.3966	-63.8325	2852.7	113.39	1.9	9	5.515	1	0.543	2
07-08-2013	3	48.8254	-63.5616	2456	237.74	4.9	2	0.749	2	0.749	2
07-08-2013	7	48.8436	-63.4488	2456	290.78	5.3	1	0.392	1	0.392	2
07-08-2013	9	48.7195	-63.1138	2670.6	338.33	5.5	0	0	0	0	2
08-08-2013	8	48.3567	-64.1706	2608.8	82.3	1.7	0	0	0	0	2
13-08-2013	7	48.3297	-64.5156	2461.6	78.64	1.6	6	3.647	4	2.596	2
13-08-2013	8	48.2456	-64.6776	2340	89.61	1.6	1	0.972	0	0	2
14-08-2013	3	47.9614	-65.338	2154.8	47.55	4.1	6	4.964	0	0	2

Date (dd-mm-yyyy)	Tow number	Latitude	Longitude	AS (m ²)	Depth (m)	T (°C)	rC/tow (number)	rW/tow (kg)	RC/tow (number)	RW/tow (kg)	TQ*
18-08-2013	7	47.3879	-63.7104	2767.2	65.84	0.2	2	1.216	0	0	2
28-08-2013	9	47.3786	-61.139	2628.1	43.89	2.8	1	0.849	0	0	2
04-09-2013	2	47.6885	-62.8124	2778.2	56.69	0.2	1	0.504	0	0	2
05-09-2013	1	47.9791	-63.4152	3036.7	76.81	0.8	5	2.419	2	0.862	2
05-09-2013	8	47.6859	-63.5023	2989.4	73.15	0.4	6	3.088	4	1.732	2
06-09-2013	5	47.2983	-63.2807	2700.5	58.52	-0.1	0	0	0	0	2
06-09-2013	7	47.177	-63.2446	2726.9	65.84	-0.1	13	7.640	0	0	2
06-09-2013	8	47.0627	-63.2111	2455	58.52	-0.1	3	1.615	0	0	2
10-09-2013	3	46.2144	-61.9304	2247	43.89	3.7	0	0	0	0	2
11-09-2013	11	46.6093	-62.6322	2430.4	47.55	1.1	0	0	0	0	2
16-09-2013	12	47.5584	-63.3575	2945.1	76.81	0.5	1	0.596	0	0	2
16-09-2013	7	47.7522	-63.1804	2979.2	71.32	0.2	1	0.468	1	0.468	2
16-09-2013	9	47.671	-63.1327	3014.7	67.67	0.2	11	6.330	5	2.640	2
25-09-2013	9	47.0372	-61.9197	2539.4	40.23	0	0	0	0	0	2
28-09-2013	2	45.9639	-61.8081	2108.4	42.06	0	3	2.382	0	0	2
28-09-2013	3	46.048	-61.7641	2108.4	49.38	0	2	1.626	1	0.850	2
28-09-2013	6	46.1087	-61.6394	2235	49.38	3.1	4	2.396	1	0.638	2
28-09-2013	9	46.2637	-61.6522	2213.8	58.52	1.2	2	1.404	0	0	2

Date (dd-mm-yyyy)	Tow number	Latitude	Longitude	AS (m ²)	Depth (m)	T (°C)	rC/tow (number)	rW/tow (kg)	RC/tow (number)	RW/tow (kg)	TQ*
29-09-2013	2	46.4601	-61.3613	2690	62.18	0.9	0	0	0	0	2
30-09-2013	2	47.4799	-60.6103	2601.4	71.32	1.5	4	2.549	1	0.576	2
30-09-2013	6	47.5231	-60.404	2507.2	301.75	5.8	0	0	0	0	2
01-10-2013	10	47.0073	-60.9549	3046.9	102.41	1.8	10	6.403	4	2.447	2
01-10-2013	7	47.0504	-60.7509	2980.1	146.3	3.6	15	12.234	2	1.637	2
01-10-2013	8	46.9796	-60.814	2947.4	135.33	3.4	30	22.727	9	6.691	2
01-10-2013	9	47.0059	-60.8932	3018.1	113.39	2	11	7.571	4	2.588	2
09-10-2013	5	46.6783	-61.7771	2774.5	65.84	0.4	7	4.158	5	2.574	2
09-10-2013	6	46.7398	-61.8661	2763	64.01	0	8	4.495	4	2.147	2
09-10-2013	7	46.7755	-61.8689	2815.9	65.84	0	2	0.808	2	0.808	2
11-10-2013	3	47.4357	-63.1283	2674.6	73.15	-0.2	25	13.934	1	0.457	2
13-10-2013	10	47.1453	-62.1811	2473.1	36.58	2.8	0	0	0	0	2
09-07-2013	10	48.1803	-62.8392	2673	74.98	0.8	9	5.122	8	4.455	3
09-07-2013	12	48.2689	-62.7878	3052	82.3	0.5	11	4.911	11	4.911	3
09-07-2013	3	48.4961	-63.3185	2961	117.04	1.4	0	0	0	0	3
10-07-2013	10	48.167	-61.9445	2388	74.98	1.1	1	0.360	1	0.360	3
10-07-2013	2	48.3025	-62.4596	2455	84.12	1	0	0	0	0	3
13-07-2013	2	47.8227	-60.9616	2629	58.52	1.1	4	2.75	2	1.245	3

Date (dd-mm-yyyy)	Tow number	Latitude	Longitude	AS (m ²)	Depth (m)	T (°C)	rC/tow (number)	rW/tow (kg)	RC/tow (number)	RW/tow (kg)	TQ*
15-07-2013	3	48.3108	-62.6818	2181	95.1	0.8	1	0.732	1	0.732	3
22-07-2013	10	47.8146	-64.1642	2669	58.52	0.8	0	0	0	0	3
22-07-2013	8	47.8258	-64.0219	2117	89.61	0.7	6	3.306	4	2.067	3
23-07-2013	10	47.1919	-64.2422	2700	42.06	2.2	0	0	0	0	3
23-07-2013	3	47.5038	-64.3901	2205	45.72	1.7	0	0	0	0	3
24-07-2013	11	47.0314	-63.5307	2146	54.86	0.1	2	1.169	0	0	3
24-07-2013	13	46.9119	-63.3162	2162	56.69	-0.1	1	0.445	0	0	3
24-07-2013	3	47.1602	-63.8371	2145	45.72	1	0	0	0	0	3
24-07-2013	7	47.2193	-63.6008	2477	64.01	-0.3	13	7.418	0	0	3
24-07-2013	9	47.0255	-63.4506	3192	51.21	0.2	6	3.860	0	0	3
25-07-2013	10	46.7035	-62.983	1970	53.04	2.5	0	0	0	0	3
25-07-2013	3	46.9708	-63.6424	1948	45.72	0.8	0	0	0	0	3
25-07-2013	5	46.787	-63.4957	2192	42.06	4.9	0	0	0	0	3
04-08-2013	11	48.0902	-63.8631	2154	96.93	1.1	14	8.039	2	1.053	3
08-08-2013	7	48.5758	-63.565	1852	131.67	2.6	1	0.369	1	0.369	3
16-08-2013	10	47.9838	-64.9277	1573	80.47	0.4	4	2.379	1	0.376	3
16-08-2013	3	47.865	-65.4895	1266	58.52	1.7	1	0.744	0	0	3
16-08-2013	5	47.892	-65.2106	1596	71.32	0.5	4	4.172	0	0	3

Date (dd-mm-yyyy)	Tow number	Latitude	Longitude	AS (m ²)	Depth (m)	T (°C)	rC/tow (number)	rW/tow (kg)	RC/tow (number)	RW/tow (kg)	TQ*
17-08-2013	10	47.6547	-63.9112	1705	51.21	1.4	0	0	0	0	3
17-08-2013	7	47.7184	-63.7614	2082	64.01	0.8	1	0.361	1	0.361	3
18-08-2013	4	47.5549	-64.1276	1919	67.67	0.8	5	3.188	0	0	3
27-08-2013	3	47.2568	-62.6322	2925	64.01	0.4	1	0.357	1	0.357	3
28-08-2013	3	47.5623	-60.8646	2743	49.38	1.6	0	0	0	0	3
31-08-2013	3	47.6797	-62.2021	1900	51.21	1.1	2	1.079	1	0.374	3
01-09-2013	11	47.8364	-62.2707	1982	62.18	0.8	1	0.683	0	0	3
01-09-2013	2	47.7762	-61.8622	2180	47.55	1.4	0	0	0	0	3
01-09-2013	6	47.7698	-62.0309	2129	49.38	1.1	0	0	0	0	3
01-09-2013	8	47.7284	-62.2075	1805	56.69	0.8	0	0	0	0	3
05-09-2013	12	47.4361	-63.6314	2514	60.35	0.5	0	0	0	0	3
05-09-2013	6	47.8318	-63.3384	3120	76.81	0.2	6	3.560	1	0.391	3
06-09-2013	2	47.2408	-63.6447	2869	64.01	0.7	4	2.201	1	0.431	3
11-09-2013	6	46.6172	-62.1504	2232	51.21	1.4	0	0	0	0	3
11-09-2013	9	46.637	-62.3776	1814	54.86	0.7	0	0	0	0	3
15-09-2013	2	48.0349	-62.373	2780	80.47	0.7	8	3.658	7	3.143	3
15-09-2013	6	47.7943	-62.777	2704	64.01	0.4	4	2.376	1	0.779	3
15-09-2013	8	47.8406	-62.7308	2870	69.49	0.7	4	1.801	3	1.257	3

Date (dd-mm-yyyy)	Tow number	Latitude	Longitude	AS (m ²)	Depth (m)	T (°C)	rC/tow (number)	rW/tow (kg)	RC/tow (number)	RW/tow (kg)	TQ ^a
16-09-2013	3	47.9362	-63.0626	2096	62.18	0.7	5	2.649	1	0.361	3
25-09-2013	3	46.8754	-61.7194	2321	54.86	0.5	7	4.384	5	2.975	3
30-09-2013	10	47.2845	-60.3412	1689	179.22	4.1	0	0	0	0	3
30-09-2013	4	47.5112	-60.4867	2032	140.82	3.3	102	70.081	41	26.318	3
01-10-2013	4	47.3099	-60.5858	3486	69.49	1.7	2	1.002	2	1.002	3
09-10-2013	4	46.5944	-61.8201	2695	54.86	0.7	1	0.513	1	0.513	3
10-10-2013	3	46.8085	-62.425	2368	58.52	0	0	0	0	0	3
11-10-2013	10	47.2993	-62.8997	2845	60.35	0	2	1.174	0	0	3
11-10-2013	8	47.328	-63.0355	2587	62.18	-0.1	16	9.661	3	1.655	3
12-10-2013	3	47.1832	-62.9809	1605	56.69	0.9	0	0	0	0	3
12-10-2013	6	47.0801	-62.9757	2899	56.69	-0.1	0	0	0	0	3
13-10-2013	2	46.8058	-62.6745	2522	60.35	-0.1	0	0	0	0	3
13-10-2013	3	46.9913	-62.7658	2965	62.18	-0.3	14	8.299	3	1.802	3
13-10-2013	7	46.9677	-62.1905	1782	54.86	0.2	1	0.388	1	0.388	3
13-07-2013	7	47.8775	-61.2818	2540.9	43.89	2.6	0	0	0	0	4
14-07-2013	6	48.4016	-62.126	2396.7	360.27	5.6	0	0	0	0	4
14-07-2013	8	48.2937	-62.1062	2487.6	109.73	1	0	0	0	0	4
22-07-2013	3	48.0626	-64.0626	2321.2	38.4	3.2	0	0	0	0	4

Date (dd-mm-yyyy)	Tow number	Latitude	Longitude	AS (m ²)	Depth (m)	T (°C)	rC/tow (number)	rW/tow (kg)	RC/tow (number)	RW/tow (kg)	TQ*
22-07-2013	5	47.9468	-64.0574	2445.7	60.35	0.7	3	1.947	2	0.988	4
02-08-2013	2	47.9654	-61.6262	2519.1	54.86	0.8	0	0	0	0	4
04-08-2013	2	48.0432	-63.1005	2714.1	58.52	0.2	0	0	0	0	4
06-08-2013	5	48.5222	-63.8437	2502.9	60.35	1.3	0	0	0	0	4
13-08-2013	3	48.2515	-64.3059	2551.6	102.41	1.4	6	4.880	1	0.737	4
18-08-2013	9	47.3061	-63.8315	2646	42.06	2.2	0	0	0	0	4
31-08-2013	5	47.6014	-62.0919	2402.6	40.23	2.3	2	0.823	1	0.401	4
06-09-2013	10	46.9597	-63.1987	2529.3	58.52	-0.1	13	7.731	1	0.766	4
12-09-2013	2	46.6058	-62.9653	2447	43.89	1.4	0	0	0	0	4
15-09-2013	10	47.8514	-62.8475	2827.5	76.81	0.5	4	1.656	2	0.758	4